

A Potassium magnetometry based current source for the nEDM experiment at PSI

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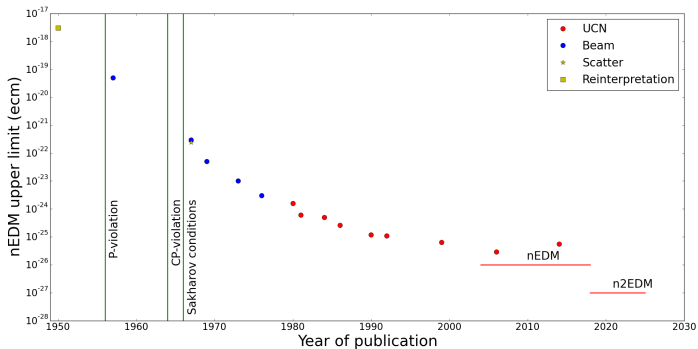
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- ▶ The reactions should happen out of thermal equilibrium

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A *differential measurement* then yields:

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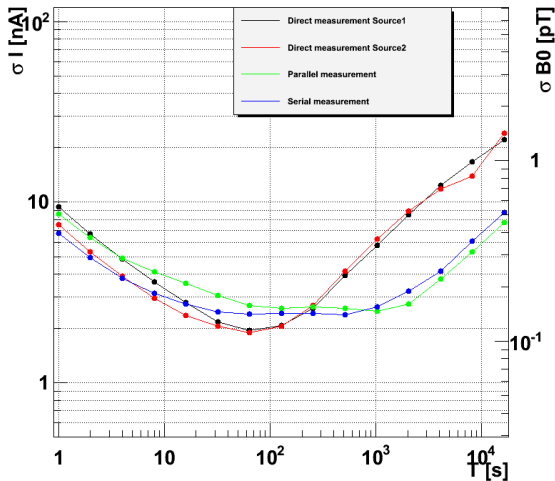
Therefore we

- ▶ shield our environment (active/passive)
- ▶ monitor the \vec{B} field with magnetometers (Hg, Cs, He)
- ▶ use a very stable current source.

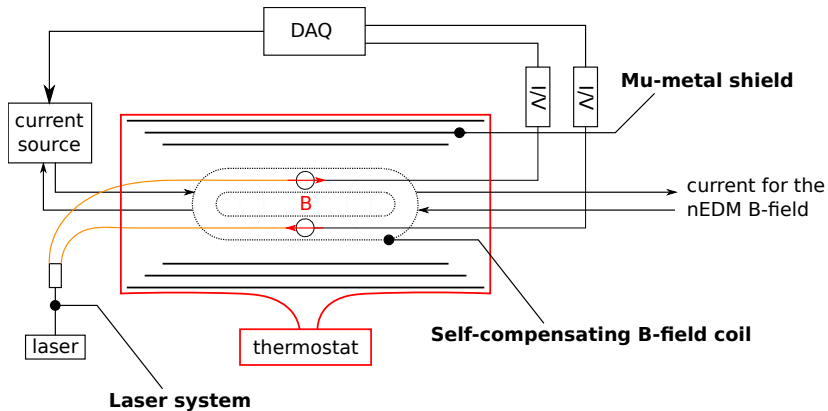
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Stability characterisation

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Principle of the new current source



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- ▶ **low gradients** → larger signal + less systematics

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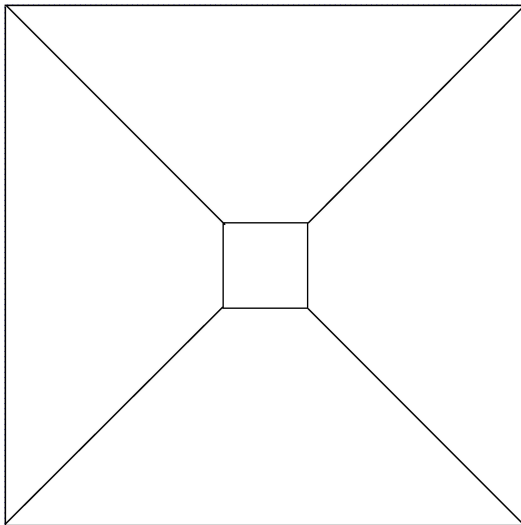
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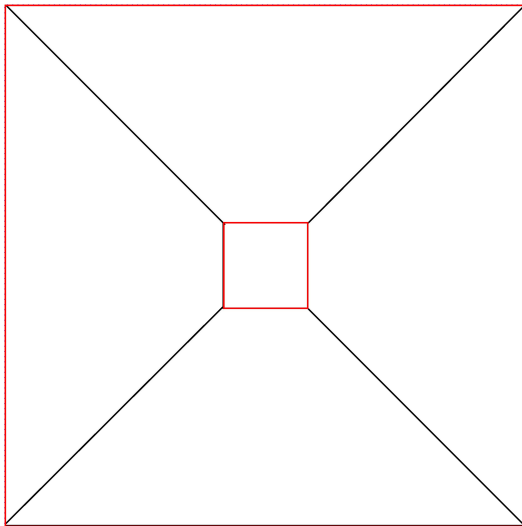
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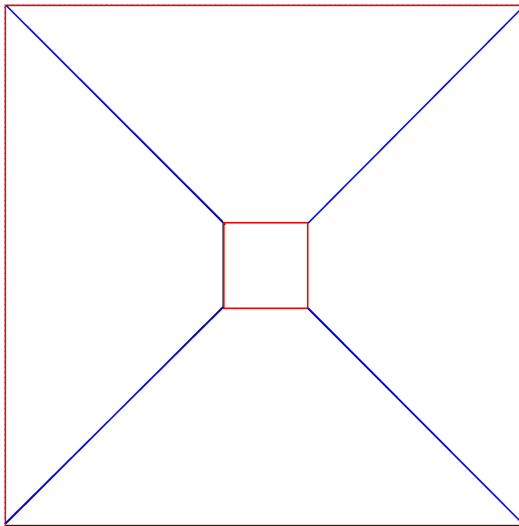
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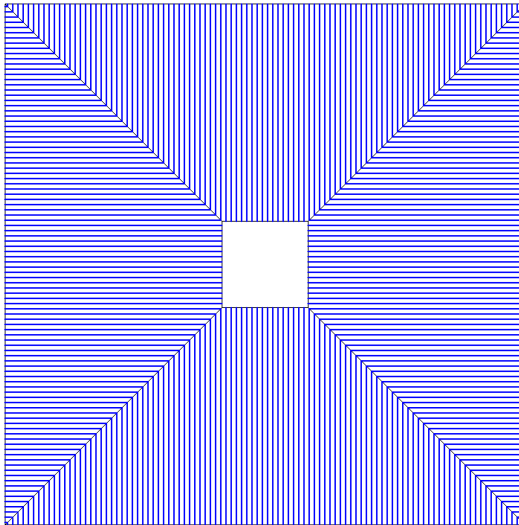
The behaviour of the field is given by the Laplace equation:

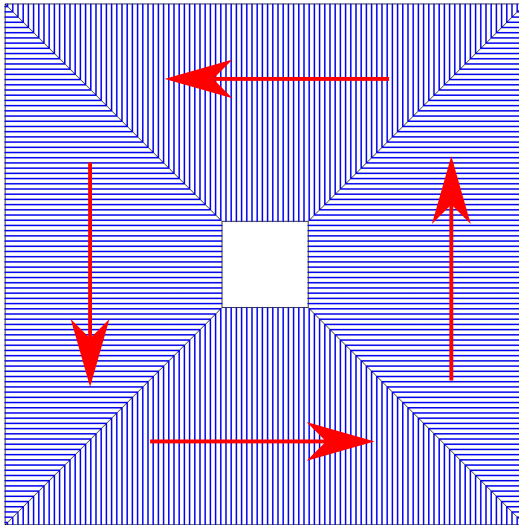
$$\nabla^2\Phi = 0$$

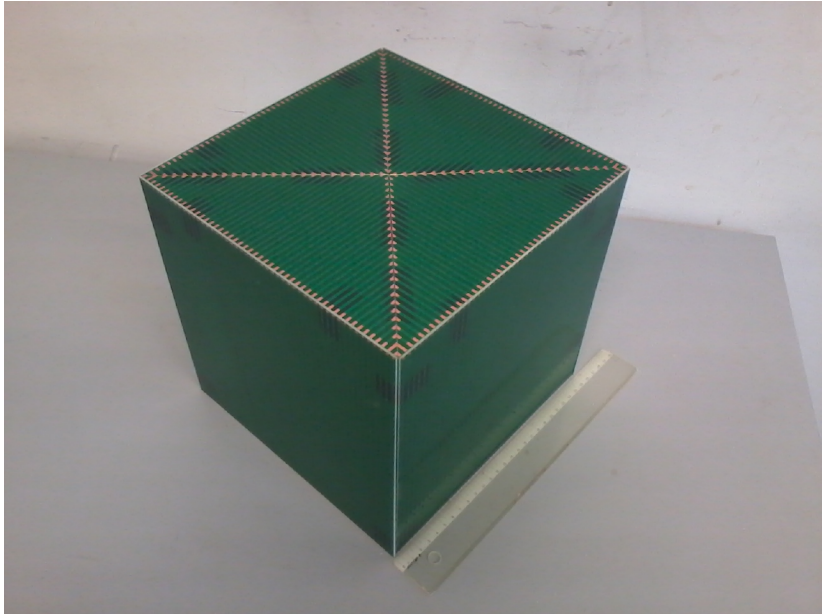


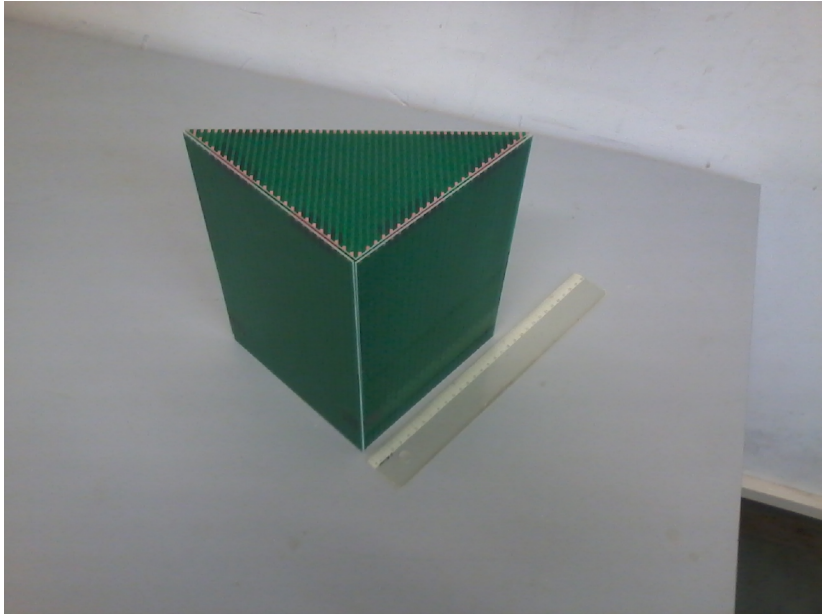


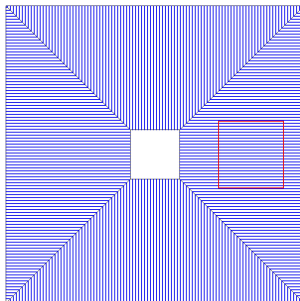


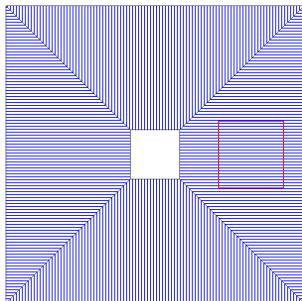




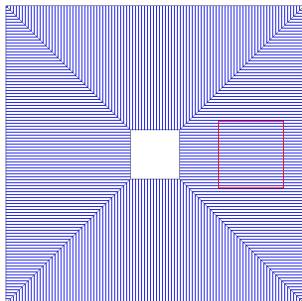






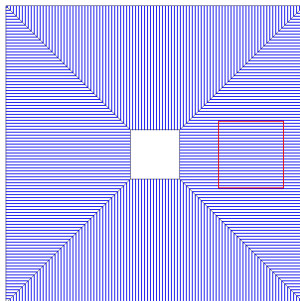


For a field $B_z = 30 \mu T$ we get gradients dB_z/dz :



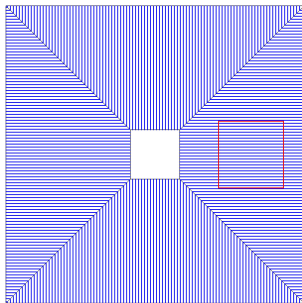
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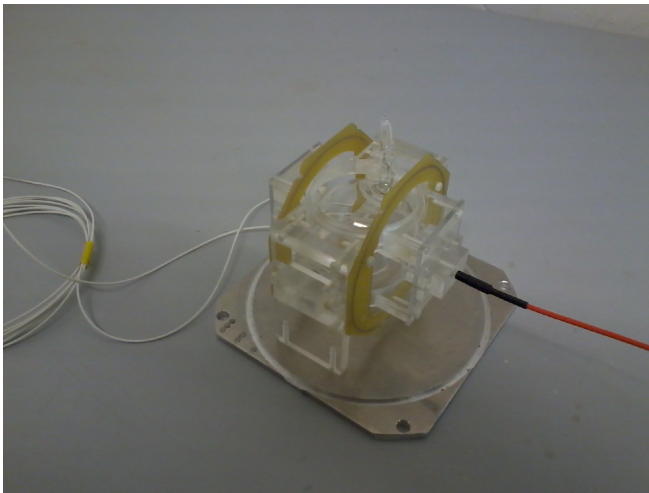
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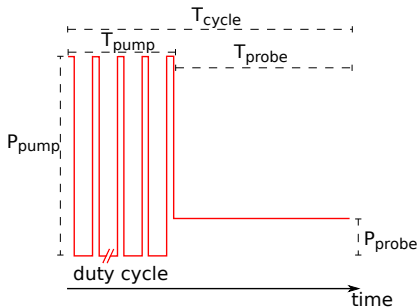
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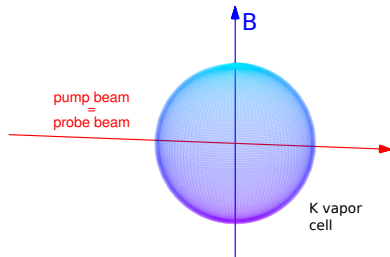
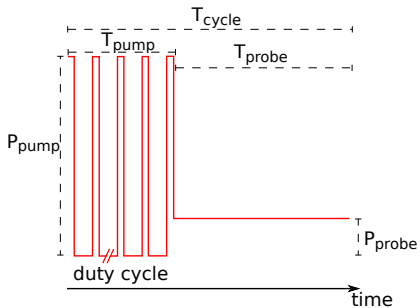
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Realistically the field homogeneity is $\approx 10^{-4}$.

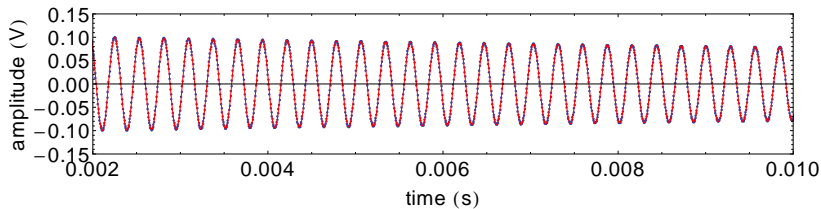
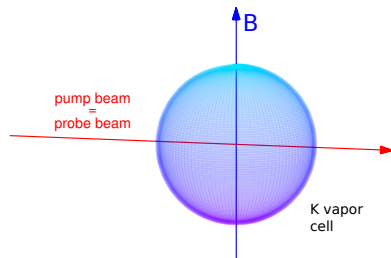
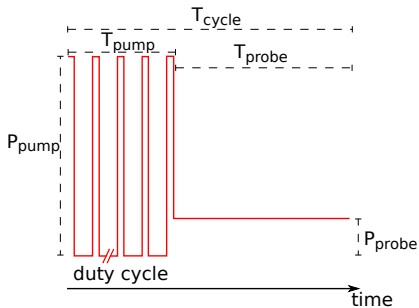


Magnetometry based on **optical pumping** of an **atomic vapor**.





The FSP method



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- ▶ Implement an array of 4 magnetometers.